The Impact of Mobile Money on Saving in Sub-Saharan Africa:

Author: Carolyn Ruh

THE IMPACT OF MOBILE MONEY ON SAVING IN SUB-SAHARAN AFRICA

by

Carolyn Ruh

A Senior Honors Thesis through the Boston College
Economics Department

Advisor: S Anukriti
Assistant Professor of Economics, Boston College

May 5, 2017

Abstract
Since the launch of M-PESA in 2007, mobile money has created the potential to increase financial inclusion by providing a safe and convenient place to store wealth. This paper analyzes the impact of mobile money on savings practices in Sub-Saharan Africa. Using 2015 survey data from Uganda, Kenya, and Tanzania, I find that mobile money account holders are 10.9 percent more likely to save than non-account holders, holding constant other characteristics. Mobile money has a positive and significant impact on saving for daily consumption, for protection against income shocks, and for business and education investments. In addition, I find that mobile money is a complement to formal savings (bank accounts) and a substitute for informal savings. By increasing saving, mobile money better enables individuals to rely on savings in the event of a negative income shock. These results are consistent with a policy agenda that promotes financial inclusion by increasing access to mobile technologies.

Acknowledgements
I'd like to thank my thesis advisor S Anukriti for guidance and feedback, Robert Murphy for direction of the Economics Honors Thesis program, Paul Cichello for an understanding of empirical methods in development economics, and John Gallaugher and Elizabeth Bagnani for teaching the TechTrek Ghana course that inspired this thesis topic. I would also like to thank InterMedia for providing access to the Financial Inclusion Insights survey data used in this paper.

1. Introduction

Savings are an important financial instrument and are increasingly recognized as a tool for poverty reduction. However, savings constraints are a significant challenge for the poor in Sub-Saharan Africa as many households do not have traditional bank accounts. In East Africa specifically, 74 percent of adults do not have an account at a formal financial institution (Demirguc-Kunt et al. 2015). The administrative fees on small savings accounts are often too high to make them worthwhile for poor households even if they are physically able to access a bank branch.

Due to the high costs of traditional financial services, many Africans rely on semiformal and informal savings mechanisms such as purchasing assets or storing money under the mattress at home. Rotating savings and credit associations (ROSCAs)[1] are widely used in Kenya and other countries as a social commitment device against time-inconsistent behavior (Gugerty 2007). However, the poor continue to face savings constraints. Dupas and Robinson (2013) found that women in particular face difficulty saving money at home. In a randomized experiment that paid the fee to open an account with a village bank in Kenya, they found that female small business owners increased usage of the account and increased their total savings. The village bank accounts paid no interest and charged a withdrawal fee, creating a de facto negative interest rate, so usage of these accounts indicates that women face negative interest rates on informal savings channels. The use of informal savings mechanisms despite high costs suggests the poor want to save and would benefit from greater access to low-cost savings mechanisms.

[1] The ROSCA, also known as the "merry-go-round," is a group of community members who gather and pool their savings into a pot that is then distributed to one member at a time (Gugerty 2007).

Increasing savings is especially important to address vulnerability in Sub-Saharan Africa. Vulnerability is defined as the likelihood of falling into or continuing to experience poverty (Hulme, Moore, and Barrientos 2009). Due to the high percentage of households engaging in subsistence agriculture in Sub-Saharan Africa, income is more likely to be cyclical and uncertain, making consumption smoothing even more important. For those who live at or near the poverty line, a financial emergency such as a poor harvest, a theft, or an unexpected medical expense could feel much more severe. For example, in Kenya in 2015, 72 percent of the population regularly experienced vulnerability, but only 28 percent had a financial plan for unexpected events. The majority of Sub-Saharan African households also lack access to credit and insurance markets, and without these consumption-smoothing mechanisms, it becomes all the more important to have savings to rely on.

Hulme, Moore, and Barrientos (2009) argue that microsavings help the poor to decrease vulnerability through a protective function (accumulating savings to use in the event of a shock) and a promotive function (accumulating assets to reduce the likelihood that a shock will take place). Those who save with formal or informal savings mechanisms are more likely to rely on savings in the event of an income shock, rather than reducing consumption, selling assets, borrowing, or increasing employment. Savings also enable individuals to invest in education, grow a business, or prepare for retirement. Investments in business assets or education are a form of capital accumulation which can lead to greater future income streams that are especially important to reduce the vulnerability of those in poverty.

This paper examines a new potential mechanism to increase saving in Sub-Saharan Africa. Over the past decade, mobile money products have spread rapidly across the continent, creating the potential for increased financial inclusion. Services such as M-PESA in Kenya, designed to facilitate money transfers, also offer a safe and convenient place to store funds. By providing a new savings mechanism, mobile money has the potential to enable consumption smoothing and, thereby, to decrease vulnerability to negative income shocks.

This paper provides a comparative analysis of the impact of mobile money on saving in Kenya, Uganda, and Tanzania. The vast majority of existing research on the effects of mobile money focuses on the example of M-PESA in Kenya, but Kenya may be uniquely suited for mobile money due to the high rural-to-urban migration and mobile technology penetration. It remains to be seen whether the "success story" of the economic impacts of M-PESA can be replicated in other countries.

Using 2015 data from the Financial Inclusion Insights survey by Intermedia, I examine the impact of mobile money on savings practices in Uganda, Kenya, and Tanzania. I estimate an OLS regression of saving on mobile money account ownership and a vector of controls in order to test whether mobile money increases the likelihood of saving. I find that mobile money account holders are 10.9 percent more likely to save than non-account holders, holding constant other characteristics. A probit model produces similar results.

I apply the same OLS regression model to test the impact of mobile money on likelihood of saving for a variety of purposes. I find that mobile money has a positive and significant impact on saving for daily consumption, for protection against income

shocks, and for business and education investments. In addition, mobile money leads to greater formal financial inclusion as it is a complement to formal savings mechanisms (bank accounts) and a substitute for informal savings mechanisms such as storing money under the mattress at home. By increasing saving, mobile money better enables people to smooth consumption and protect against unexpected events. I find that mobile money account holders are 8.0 percent more likely to rely on savings than non-account holders when faced with a negative income shock, controlling other characteristics. However, I do not find that mobile saving has a significant impact on education outcomes as measured in the data.

In order to provide a robustness check against possible endogeneity in the OLS regression model, I perform an instrumental variable estimation using distance to agent as an instrument for mobile money account ownership. The 2SLS results are consistent with the finding that mobile money has a positive and significant impact on the likelihood of saving.

The paper is organized as follows. Section 2 presents background information on mobile money in Sub-Saharan Africa. Section 3 reviews existing literature on the relationship between mobile money and savings. Section 4 describes the survey data on financial inclusion in Uganda, Kenya and Tanzania. Section 5 explains the empirical methods used to analyze the data. Section 6 presents the results and robustness checks. Section 7 concludes with a discussion of the future of mobile savings.

2. Background on Mobile Money in Sub-Saharan Africa

Over the course of the past decade, mobile technologies have become widespread in Sub-Saharan Africa. Although the region continues to experience low

infrastructure development and high poverty rates, a report by GSMA Intelligence finds that 41 percent of the population was a mobile phone subscriber as of 2015, generating widespread optimism about the potential of mobile technologies to spur economic growth. One of the most promising technologies to grow out of this "Silicon Savannah" is mobile money, a money transfer service that is available on the mobile phone.

Mobile money in Kenya began in 2007 when Safaricom, the largest mobile phone operator in Kenya, launched a money transfer service known as M-PESA (Jack and Suri 2011). The product was marketed as an inexpensive and convenient way to "send money home," especially for those in urban areas who send remittances to family in rural areas. M-PESA grew rapidly because it relies on the existing mobile infrastructure does not require a smartphone or app to use. Within the first three months of the product's launch, 111,000 accounts were registered and 450 agent outlets opened, exceeding the 350 Western Union agents in all of Kenya (Vaughan 2007). As of 2015, the agent network consists of 110,000 agents and at least one individual in 96 percent of Kenyan households has used M-PESA (Jack and Suri 2016).

M-PESA aims to facilitate money transfer by allowing mobile phone users to deposit, withdraw, and transfer money through a mobile account. Any mobile phone user can open an account and go to a local agent to convert cash into an electronic currency that is stored in the mobile account associated with their phone's SIM card. The funds in the mobile account can then be sent to another registered or non-registered mobile money user. Today, M-PESA is also used to store money, to purchase airtime, and even to pay bills or school fees.

Kenya has remarkably high rates of mobile money penetration, with 67 percent of the adult population reporting that they have a mobile money account as of 2015. M-PESA is therefore the "success story" of mobile money and the focus of much research in the field. However, M-PESA is not the only example of a mobile money product. Services such as Smart Money and G-Cash in the Philippines and Wizzit in South Africa preceded M-PESA and were pioneers in developing mobile money since 2004 (Ndiwalana, Morawczynski, and Popov 2013). Today, mobile money products are widespread in many Sub-Saharan African countries. There are 13 countries globally with at least 10 percent of adults using mobile money, and they are all in Sub-Saharan Africa (Demirguc-Kunt et al. 2015). As **Figure 1** shows, Kenya, Somalia, Uganda, and Tanzania are all hotbeds of mobile money use, with at least one-third of their adult populations reporting that they have a registered mobile money account.

Some mobile money users take advantage of dual-SIM capabilities on their phone to open accounts with more than one mobile money provider. As a result, the number of accounts has rapidly increased since the launch of M-PESA in 2007. **Figure 2** shows the number of accounts per 1,000 adults since 2007 in the six African countries with the highest mobile money concentrations. It is worth noting that Kenya, Uganda, and Tanzania all have more mobile money accounts than people, which is likely due to the common practice of using a dual-SIM phone and opening multiple accounts with different mobile network operators.

This paper focuses on Kenya, Uganda, and Tanzania as they are among the four countries in Sub-Saharan Africa with the highest mobile money penetration.[2] The

[2] Although the World Bank Global Findex data in Figure 1 finds higher mobile money use in Somalia than Uganda and Tanzania, Somalia is excluded from this paper due to a lack of data availability.

inclusion of data from Uganda and Tanzania provides an interesting expansion of the existing literature on Kenya as they too have high rates of mobile money use (about two-thirds of Tanzanians and one-third of Ugandans use mobile money), but lower formal financial inclusion (88 percent of Ugandans and 91 percent of Tanzanians are unbanked). Mobile money is a driving force for financial inclusion in all three countries, creating the possibility to change savings behaviors.

Mobile money in Tanzania began one year after the launch of M-PESA, when Vodafone, the parent company of Safaricom, launched a similar mobile money product under the name Vodacom M-PESA. The same advertising campaigns were used with the slogan "send money home." However, M-PESA in Tanzania had slower uptake than in Kenya, likely due to the country's lower population density as well as its lower economic development and financial inclusion (Camner, Pulver, and Sjöblom 2012). Initially, the M-PESA fee structure differed between Kenya and Tanzania: in Kenya there was a fixed fee for transfers while in Tanzania the fee increased with the amount of the transfer. As of August 2009, Vodacom changed the pricing scheme in Tanzania to a flat fee of 200 Tanzanian shillings per transfer (Camner, Pulver, and Sjöblom 2012). Vodacom M-PESA still retains a dominant market position in Tanzania despite a competitive mobile money market. As of 2015, 63 percent of active mobile money users were registered with Vodacom M-PESA, compared to 37 percent with Tigo Pesa and 27 percent with Airtel Money.[3]

Uganda became the third major mobile money hotspot in Africa with the launch of MTN Mobile Money in 2009 (Ndiwalana, Morawczynski, and Popov 2013). A

[3] The sum of these percentages exceeds 100 percent because it is common to have dual SIM phones, so some mobile money users have a registered account with more than one provider.

regulatory framework for mobile money in Uganda was created with the Bank of Uganda's Mobile Money Guidelines in 2013. Currently, the main mobile money products in Uganda are MTN Mobile Money and Airtel Money. MTN Mobile Money is used by 82 percent of mobile money users, while Airtel is used by 35 percent. Other less commonly used mobile money products include M-Sente by Uganda Telecom, Orange Money, and Ezee Money.

In all three countries, mobile money accounts do not typically pay interest, and the money can be easily accessed at any time via the mobile phone. The lack of interest and ease of access do not provide incentives to keep large quantities of funds in the account for an extended period of time. However, the fee structure of mobile money may incentivize saving, as the platform does not charge fees to put money into a mobile account, but does charge a small withdrawal fee. Once a mobile money user has funds in his or her account (either from a personal deposit or from a person-to-person transfer), he or she may be inclined to keep the funds in the account and avoid the withdrawal fee, instead saving the money for future use. The structure of a mobile money account is more similar to a checking account than a savings account, making it likely that people use it to store funds for daily consumption rather than to save for long-term purposes such as retirement.

Some mobile money providers have recently launched interest-bearing mobile money products, such as M-Kesho and M-Shwari by Safaricom M-PESA in Kenya in 2010 and 2012, M-Pawa by Vodacom M-PESA in Tanzania in 2014, and MoKash by MTN in Uganda in 2016 (Demombynes and Thegeya 2012; Cook and McKay 2015). Several mobile money providers also partner with banks to offer the ability to transfer

funds between a mobile money account and a traditional bank account. For example, MTN in Uganda partners with Centenary Bank, Bank of Africa, and several other banks to enable mobile access to one's account. These developments have the potential to create easy access to formal bank accounts and interest-bearing savings, however, these services are outside the scope of this paper due to their recent introduction and the lack of available data on their usage. Even with withdrawal fees and no interest, the widespread savings constraints in Sub-Saharan Africa may make mobile money an attractive means of storing wealth.

3. Literature Review

Several researchers have investigated the relationship between mobile money and savings, with most focusing on M-PESA in Kenya. In a more qualitative analysis, Morawczynski (2009) analyzed financial diaries of M-PESA users and concluded that M-PESA is a complement to other savings products, playing a vital role in the savings portfolio of poor households, as it is "more accessible and cheaper than the bank" but more secure than the mattress at home. Some individuals used their M-PESA account to accumulate small amounts of money before remitting a lump sum to a relative back home. For small savings, respondents indicated a preference for M-PESA over banks due to high bank account maintenance fees, distance to banks in rural areas, as well as general mistrust of the financial system. However, anecdotal evidence from the financial diaries suggests that M-PESA is infrequently used for long-term savings because it does not pay interest or offer credit. Some individuals are not aware of the savings capabilities of M-PESA because Safaricom faces legal challenges in advertising M-PESA as a savings mechanism, so its use depends heavily on word of mouth.

Morawcsynski and Pickens (2009) also cite convenience as a driving factor in determining whether M-PESA is used as a savings mechanism. In an urban slum outside Nairobi, nearly one-third of M-PESA users use M-PESA to save, as there are no banks but more than 40 M-PESA agents within the informal settlement. M-PESA is often used as a substitute for informal savings mechanisms such as the home bank. However, in a more rural community, M-PESA is rarely used for saving because agents often run out of cash float, creating liquidity issues.

Jack and Suri (2011) analyzed survey data and similarly concluded that M-PESA has become a common means of storing wealth. In a 2008 survey, 76 percent of M-PESA users reported saving with M-PESA, and by 2009 this had increased to 81 percent. These savings rates are much higher than those found in other literature, likely due to the broad definition of savings as simply having a balance of funds in one's mobile money account. They also find that ease of use and safety were the most common reasons for saving with M-PESA. M-PESA users who have a bank account were much more likely to save than those without a bank account, indicating that M-PESA may be a complement to traditional savings products. These results indicate a possible correlation between M-PESA and savings but do not necessarily prove a causal relationship.

Jack and Suri (2014) further investigate the impact of M-PESA on consumption smoothing through receipt of remittances when faced with an economic shock. They find that non-M-PESA users see a 7-10 percent reduction in consumption in the event of a negative shock, while M-PESA users see a smaller reduction in consumption that is statistically indistinguishable from zero. The difference-in-difference results are

compared to an instrumental variable estimation, using agent density as an instrument, to provide robustness against concerns of bias. Jack and Suri (2014) also find that the relationship between mobile money and smoothing income shocks is stronger for lower-income individuals. This paper examines a similar question of whether mobile money enables individuals to smooth consumption in the event of a financial emergency, but will do so by looking at the savings capabilities of mobile money rather than its use for person-to-person transfer.

Mbiti and Weil (2011) present evidence that is somewhat contradictory to Jack and Suri (2011), finding that M-PESA is used for safe storage of funds while traveling, but is rarely used to store value for a significant period of time. However, their instrumental variable analysis shows that M-PESA increases the percentage of the population using formal bank accounts by almost 11 percentage points, suggesting that M-PESA is a complement to the formal banking system. They also find that M-PESA replaces other informal savings mechanisms such as ROSCAs. This paper will similarly analyze the relationship between mobile money and other savings mechanisms, but will use a cross-country data set to see if the findings of Mbiti and Weil (2011) are consistent in other countries.

Demombynes and Thegeya (2012) expand upon the existing literature by studying the use of M-Kesho, an interest-bearing savings product in Kenya launched in 2010 by a partnership between Safaricom and Equity bank. They find that M-Kesho use is extremely low, at 0.6 percent of the population, and is almost entirely wealthier individuals. However, they find that basic savings in the mobile account is more common, with 15 percent of the population using M-PESA to save. Based on an

instrumental variable analysis, they find that M-PESA usage increases likelihood of having some savings by 20 percent.

Although most existing literature on mobile money and savings focuses on the example of Kenya, Ky, Rugemintwari, and Sauviat (2016) examine the relationship between mobile money and savings in Burkina Faso. They find that mobile money services have a positive impact on one's ability to save for unpredictable purposes such as health emergencies, but no significant impact on overall saving or saving to develop an activity. The impact of mobile money on saving for health emergencies is stronger for rural areas, females, less educated individuals, and those with irregular incomes. These results support the hypothesis that mobile money is used more for short-term savings than long-term savings. Due to the low mobile money penetration in Burkina Faso, this paper will apply the empirical methods of Ky, Rugemintwari, and Sauviat (2016) to examine the impact of mobile money on saving for various purposes in countries where mobile money is used by a broader segment of the population.

Focusing specifically on Uganda, Lwanga and Adong (2016) find that mobile money is not commonly used in Uganda for savings purposes. Survey data from 2013 shows that while more than half of the Ugandan population saved through informal means, only 3 percent saved through mobile money. An instrumental variable analysis of the survey data shows that having a registered mobile money account does increase savings with the platform, but does not affect saving via other formal and informal savings mechanisms.

This paper seeks to expand the existing literature in four key ways. *First*, I examine whether the positive relationship between mobile money and savings also holds

outside Kenya by using a three-country data set of Kenya, Uganda, and Tanzania. *Second*, while most studies estimate the impact of mobile money on overall likelihood of saving, I analyze the relationship between mobile money and saving for various purposes, expanding upon Ky, Rugemintwari, and Sauviat (2016) who measure saving for health purposes in Burkina Faso. *Third*, I consider savings via mobile money as a way to enable people to cope with negative shocks, similar to Jack and Suri (2014) but examining the savings function of mobile money instead of the remittance function as a mechanism to smooth consumption. *Fourth*, I use more recent data from 2015 in order to examine current trends in the relationship between mobile money and saving, as use of mobile money as a savings mechanism has been increasing in recent years.

4. Data

The analysis in this paper uses individual level survey data from the Financial Inclusion Insights (FII) survey by InterMedia. The survey was conducted in Uganda, Kenya, Tanzania and five other countries.[4] For each country, three waves of the survey were conducted in 2013, 2014, and 2015. The sample consists of approximately 3,000 observations of adults age 15 and older per country. InterMedia worked with the National Bureau of Statistics of each country to draw a nationally representative sample frame consisting of a number of enumeration areas (EAs) by district. A random sample of 300 EAs from urban and rural strata was selected from each sample frame and ten individuals were randomly selected within each EA for a 45-60 minute interview. In addition to basic demographic information, the survey asked questions about use of

[4] The survey was also conducted in India, Bangladesh, Indonesia, Pakistan, and Nigeria. As this paper focuses specifically on mobile money in Sub-Saharan Africa, data from countries outside of Africa is left out of the analysis. In addition, data from Nigeria is excluded as mobile money account penetration is less than 1 percent.

financial services (bank accounts, mobile money, and non-bank financial institutions such as microfinance institutions and savings and credit cooperatives), general financial behaviors, mobile access, as well as financial and digital literacy.

The main analysis in this paper uses the 2015 wave of the survey because of the lack of comparable data across rounds. In 2013 and 2014, the survey questionnaire asked about use of mobile money specifically to save for a future purchase or payment, while the 2015 survey just asked if respondents save via mobile money. The 2013 survey did not include questions on location of saving or purpose of saving. Several other key control variables such as employment status and experience of negative income shocks are also defined more narrowly in the 2013 and 2014 waves. Since the data is not directly comparable across years, I focus on the most recent data in order to understand the current status of mobile money use.

Table 1 presents summary statistics from the 2015 data for each country. Panel A presents basic demographics of the samples. Overall, the sample in Tanzania is more urban, more educated and literate, and more likely to be above the poverty line than the samples in Uganda and Kenya. The Kenyan sample is also less likely to be employed in irregular work (casual day labor, seasonal labor, or self-employment) and agricultural occupations than the Ugandan and Tanzanian samples.

Panel B shows summary statistics of financial inclusion in each country, revealing the ubiquity of mobile money as of 2015 in all three countries. In Uganda, over one-third of the population has a mobile money account (35.2 percent), while in Kenya and Tanzania nearly two-thirds of the population has a mobile money account (66.8 percent and 61.2 percent respectively). Usage of mobile money, whether or not

one has a registered account, is even higher: almost half (47.3 percent) of Ugandans have used mobile money at some point in their lifetime, compared to 78.9 percent of Kenyans and 62.6 percent of Tanzanians. Similarly, mobile phone ownership is lowest in Uganda, at 54.5 percent, while in Kenya and Tanzania, mobile phone ownership is at 75.8 percent and 76.7 percent respectively. Therefore, it is clear that mobile phone penetration and mobile money penetration is high in all three countries, but higher in Kenya and Tanzania. Kenya also has greater formal financial inclusion than the other two countries, as 27.9 percent of the population has a formal bank account, compared to 11.6 percent in Uganda and 9.4 percent in Tanzania. In all three countries, mobile money penetration is higher than formal financial inclusion, indicating that mobile money is providing financial services to many who are traditionally unbanked.

Mobile money users also have distinct characteristics that, at times, differ from the broader population. **Table 2** presents the summary statistics of demographics and financial inclusion with a comparison between mobile money account holders and those who do not have mobile money accounts. In all three countries, mobile money account holders are more male, more educated, and more likely to live in urban areas. Interestingly, mobile money users are also more likely to be below the poverty line.

As shown in Panel B, almost all mobile money account holders own a mobile phone or have access to a mobile phone (typically by using the phone of another member of the household). Meanwhile, mobile phone penetration is low among those without mobile money accounts, at 33.9 percent in Uganda, 37.9 percent in Kenya, and 47.7 percent in Tanzania, revealing that the lack of a mobile phone is a key barrier to mobile money growth. However, it is possible to use mobile money without a registered

account by using it over-the-counter with an agent, which typically incurs a higher fee. Non-registered users may also use the account of a friend or family member. As a result, 39 percent of Kenyan non-account holders have used mobile money at some point in their lifetime. In Uganda and Tanzania, usage rates of non-account holders are 20 percent and 13 percent respectively.

In all three countries, most people who have registered mobile money accounts use them regularly. The survey data finds that 87 percent of Tanzanian users, 88 percent of Ugandan users, and 91 percent of Kenyan users have actively used their accounts within the last 90 days. Mobile money users are also more likely to be financially included and have accounts at formal banks or other non-bank financial institutions.

The survey also collects data on the individual's financial behaviors and savings practices. The summary statistics of the purpose of savings are reported in **Table 3**. The most common reasons to save are to protect one's family from poverty and crime (50.2 percent), to protect one's belongings (39.0 percent), and for daily consumption needs (52.5 percent), reflecting the importance of short-term saving in Sub-Saharan Africa. Common long-term savings goals are to grow a business (36.1 percent) or to pay for a child's education (15.2 percent). Mobile money account holders are more likely to save than the average adult across all categories of saving.

The survey also collects information on modes of savings and indicates that mobile money is being used for saving. Throughout this paper, saving via mobile money is defined as keeping a balance of funds in one's mobile money account for future use. The usage of various savings mechanisms by country is presented in **Figure 3**. In Kenya, mobile money is the most common location of savings, as 39 percent of

the population saves via a mobile money account, while 30 percent save under the mattress at home and 22 percent save in formal bank accounts. The data from Tanzania also suggests that mobile money is the most common savings mechanism: 22 percent save with mobile money compared to 21 percent under the mattress and 8 percent in formal bank accounts. In Uganda, saving under the mattress and in ROSCAs is more common, used by 34 percent and 24 percent of the population respectively. However, mobile money is still the third-most commonly used location of savings at 16 percent. Overall, informal savings channels are more commonly used than formal bank accounts, but mobile money is increasingly becoming one of the most utilized mechanisms to store wealth.

5. Empirical Strategy

Although the summary statistics from the data indicate that mobile money is used for saving, they do not necessarily show a causal relationship between mobile money use and savings. Mobile money users may have a higher propensity to save than non-mobile money users due to both observable and unobservable factors. For example, mobile money users are more educated and more likely to be employed than non-users, which may increase the likelihood of saving. Individuals may also sign up for mobile money with the intent to start saving, creating an endogeneity problem. Empirical methods are necessary to estimate the extent to which mobile money increases savings.

In order to estimate the impact of having a mobile money account on an individual *i*'s saving behavior, I estimate the following Ordinary Least Squares (OLS) regression:

$$saving_i = \beta_0 + \beta_1 MM\_acct_i + \beta_2 X_i + u_i \quad (1)$$

where $saving_i$ is a dummy variable of whether or not an individual saves,[5] MM_acct_i is a dummy variable for whether or not an individual has a mobile money account, and X_i is a vector of controls, including age, age squared, gender, rurality, marital status, number of children, completion of primary education, poverty index,[6] phone ownership, employment status (employed in salaried work, irregularly employed, or unemployed), and occupation (farm, business, or professional).[7] The coefficient of interest β_1 tests whether mobile money account holders are more likely to save than non-account holders when controlling for demographic characteristics. The vector of controls X_i accounts for underlying differences in the propensity to save across different subgroups of the population that are correlated with mobile money account ownership. Linearized standard errors are computed based on the sampling weights and stratification of the survey data. The same equation is used for several saving outcomes, including overall saving, saving by purpose, and saving by location. Due to the possibility of endogeneity, an instrumental variable specification is explored in Section 6.D as a robustness check.

Next, I pool the data across the three countries in order to examine the impact of mobile saving throughout the region. I once again estimate equation (1) for the outcome of overall saving, adding country dummies to the vector of controls X_i. Then, in order to verify the conclusion that the impact of mobile money on saving is consistent across all

[5] The survey questionnaire asks "Do you save with any of the following..." and lists a variety of financial instruments. If the individual responded yes to using any of the savings mechanisms, they are considered to be an individual who saves.

[6] Poverty is measured by the Progress out of Poverty Index® (PPI®), a composite score based on a survey of questions to determine likelihood of living at or near the poverty line.

[7] Age, age squared, poverty index, and number of children are continuous variables; gender, rurality, marital status, completion of primary education, and phone ownership are dummy variables; employment status and occupation are categorical variables.

three countries, I add interaction terms between each country and mobile money account ownership to test if the impact of mobile money on savings differs across countries. In the following equation:

$$saving_i = \beta_0 + \beta_1 MM\_acct_i + \beta_2 X_i + \beta_3 uganda_i + \beta_4 tanzania_i \quad (2)$$
$$+\beta_5 uganda_i * MM\_acct_i + \beta_6 tanzania_i * MM\_acct_i + u_i$$

the coefficients of interest are β_1, which measures the increased likelihood of saving for mobile money account holders, and β_5 and β_6, which test whether mobile money account holders are more likely to save if they are from a particular country.

In the OLS specification, the dependent variables (overall saving, saving by purpose, saving by location, and use of saving to respond to shocks) are all binary outcomes. The survey data does not include information on the amount of saving, and therefore it is not possible to use a continuous dependent variable. Using a linear probability model with a binary outcome runs the risk of creating predictions outside the range of 0 and 1. As a result, the OLS coefficients are compared to a probit model. The following specification is used:

$$PROB\{saving_i = 1\} = f(\beta_0 + \beta_1 mm\_acct_i + \beta_2 X_i + u_i) \quad (3)$$

where $f(*)$ is the standard normal cumulative distribution function. The probit specification is similar to that used in existing literature (Demombynes and Thegeya 2012; Lwanga and Adong 2016; Ky, Rugemintwari, and Sauviat 2016). The coefficient β_1 measures the marginal effect of mobile money account ownership on the probability

of saving. As I estimate the probit specification in the cross-country data set, the vector of controls X_i includes country dummies in addition to the controls used in equation (1).

After examining the impact of mobile money account ownership on the likelihood of saving, I turn to the role of mobile money in enabling users to cope with negative income shocks. The data reveals that individuals in Uganda, Kenya, and Tanzania often encounter negative income shocks. The most common shocks are bad weather or crop failure, followed by medical emergencies and theft (see **Table A.1** for full data on the frequency of various types of negative income shocks). Those who are near the poverty line face extreme vulnerability to income shocks and often have to decrease consumption if they lack the ability to rely on savings or to acquire funds from friends and family.

I use a model inspired by Jack and Suri (2014), who examine the impact of mobile money on consumption smoothing during shocks through the receipt of remittances. Instead, however, I focus on how mobile money can enable consumption smoothing by increasing the likelihood that a user can rely on savings when faced with a negative income shock. I estimate the following OLS model:

$$shock\_saving_i = \beta_0 + \beta_1 MM\_acct_i + \beta_2 shock_i + \beta_3 shock * MM\_acct_i + \beta_4 X_i + u_i \quad (4)$$

where $shock\_saving_i$ is a dummy variable for use of savings to cope with a negative income shock, $shock_i$ is a dummy variable for experiencing a negative income shock in the past two years, and $shock * MM\_acct_i$ is the interaction between experiencing a negative income shock and having a mobile money account. The vector of controls, X_i, is the same as in the equation for saving outcomes. β_1 tests whether mobile money

account holders who did not encounter an income shock in the last two years are more likely to rely on savings than non-account holders when faced with negative income shocks. β_2 measures the difference in reliance on savings to deal with shocks between non-account holders who encountered a shock in the past two years and those who did not. The coefficient of interest β_3 tests whether mobile money account holders who encounter negative income shocks are more likely to rely on savings to deal with these shocks. This OLS specification does not necessarily estimate the causal impact of mobile money account ownership on use of savings during negative income shocks, as mobile money account holders may have a higher propensity to save even when controlling for covariates. To provide a robustness check of the causality of these estimates, I present an instrumental variable version of equation (4) in Section 6.D.

In order to further investigate the impact of using mobile money to save for education, I examine the additional outcome of school enrollment rates and test if they are affected by mobile money account ownership. I estimate the following model:

$$school\_enroll_i = \beta_0 + \beta_1 MM\_acct_i + \beta_2 X_i + u_i \quad (5)$$

where $school\_enroll_i$ is the percentage of children in the household of school-going age who are currently enrolled in school. The coefficient of interest β_1 tests whether the children of mobile money account holders are more likely to attend school than those whose parents do not have mobile money accounts.

6. Results

6.A. Savings Outcomes

The regression results for savings outcomes using the basic specification, equation (1), are presented in **Table 4**. Column 1 shows that mobile money account holders are more likely to save than non-account holders in all three countries. Controlling for a set of covariates, mobile money account holders are 10.5 percent more likely to save in Uganda, 8.6 percent more likely to save in Kenya, and 11.1 percent more likely to save in Tanzania, relative to non-account holders.

In the pooled cross-country data set, mobile money continues to have a positive and significant impact on savings. Column 1 of **Table 5** shows the results of an estimation of equation (1) in the cross-country data set. Across all three countries, mobile money increases likelihood of saving by 10.9 percent, an effect that is significant at the 1 percent level. The impact of mobile money on savings does not appear to differ significantly between the three countries. As shown in column 2 of **Table 5**, the interaction terms between each country and mobile money account ownership do not have a significant effect on likelihood of saving. The results of cross-country regressions by purpose of saving, location of saving, and heterogeneous effects are presented in the appendix.

Column 3 of **Table 5** presents the results for the probit regression of overall saving on mobile money account ownership in the pooled cross-country data set, as specified in equation (3). In the probit model, mobile money has a similar positive relationship with saving that is significant at the 1 percent level. Holding constant the controls, having a mobile money account increases the likelihood of saving by 10.7

percent. The linear probability model is used for the remained of the analysis because the results are similar to the probit model. Additional probit results for the other outcomes are included in the appendix tables.

Next, I estimate equation (1) to examine the relationship between mobile money account ownership and saving for various purposes, including: business, education, retirement, buying assets, protection against emergencies, protection of belongings, and daily life. The purpose of this exercise is to understand if mobile money is better suited for certain forms of saving relative to others. The results are presented in columns 2–8 of **Table 4**.

Mobile money account holders appear to be more likely to save for a number of purposes, including short-term needs (daily consumption and protection against emergencies) as well as long-term objectives (businesses and education), with no significant impact on saving for retirement or to make expensive purchases.[8] The positive and significant coefficients on saving for business and education are a departure from existing literature and indicate that use of mobile money as a savings mechanism may not be limited to the short term. For mobile money account owners, likelihood of saving for business purposes is 9 percent higher in Uganda and 5.7 percent higher in Kenya. In Tanzania, the only purpose of saving that significantly increases is education—mobile money account holders are 8.5 percent more likely to save for education than non-account holders, significant at the 1 percent level. However, it is worth noting that about half of the sample in Tanzania did not respond to questions

[8] In fact, in Kenya, mobile money decreases the likelihood of saving to make expensive purchases, with a coefficient that is significant at the 5 percent level.

regarding the purpose of saving, so the lack of significant results on saving for other purposes may be due to a lack of statistical power in the smaller sample.

Columns 6–8 show that mobile money is also a mechanism to increase saving for emergencies as well as for daily consumption. In Uganda and Kenya, mobile money increases likelihood of saving to protect against poverty and crime by 6.2 percent and 9.7 percent respectively. These impacts are important to show that mobile money can help to decrease vulnerability to negative income shocks. In addition, mobile money enables greater consumption smoothing, which is especially important for those with cyclical and uncertain income. In Uganda, mobile money account holders are 8.5 percent more likely to save for daily life than non-account holders. In Kenya, mobile money account holders are 1.3 percent more likely to save for daily life than non-account holders.

The same empirical method can be used to analyze additional dependent variables for location of savings, such as the mattress, the ROSCA and the formal bank account. The results for these outcomes shed light onto the question of whether mobile money increases financial inclusion and the use of formal savings channels. The existing literature finds that M-PESA in Kenya is a complement to the bank account and a substitute for informal savings mechanisms (Mbiti and Weil 2011); I test these findings in the broader three-country data set to confirm their validity.

The results for location of savings are presented in **Table 6**. In all three countries, mobile money account ownership increases saving with a formal bank account and decreases saving in the home bank or mattress. In Uganda, Kenya and Tanzania, mobile money account holders are 9.9 percent, 7.2 percent, and 5.2 percent

more likely to save with a bank account than non-account holders. Meanwhile, mobile money decreases the likelihood of saving under the mattress by 11.3 percent in Uganda, 9.0 percent in Kenya, and 4.5 percent in Tanzania. The impact on other common savings mechanisms is inconclusive. All coefficients are indistinguishable from zero except for a 5.1 percent decrease in likelihood of saving with friends in Kenya and a 3.3 percent increase in likelihood of saving with a ROSCA in Kenya. The results in **Table 6** confirm the findings of Mbiti and Weil (2011) by showing that mobile money is a complement to formal savings and a substitute to informal savings.

The simple regression analysis of overall saving on mobile money account ownership has the potential to obscure heterogeneous effects. Mobile money may have a very different impact on saving in urban and rural areas, as Morawcsynski and Pickens (2009) find that liquidity issues in rural areas make it difficult to use mobile money as a savings mechanism. At the same time, mobile money could have a greater impact on savings among the traditionally financially excluded (poor, rural, unbanked) by providing a new savings mechanism that is secure and convenient to use. Mobile money is also theorized to have a greater impact on those who are able to use it, namely literate individuals who own a mobile phone. Analyzing the regression results by characteristics of users will help to answer the question of who exactly is increasing saving as a result of mobile money.

The results for the heterogeneous effects of mobile money on savings are shown in **Table 7**. In general, across all three countries, mobile money appears to have a greater impact on saving for those who are traditionally financially excluded (rural, below the poverty line, unbanked and working in agriculture) but are able to use mobile

money (literate and own a mobile phone). One interesting finding to note is that in all three countries, mobile money has a larger impact on likelihood of saving in rural than urban areas. This finding contradicts the qualitative evidence from Morawcsynski and Pickens (2009), suggesting that liquidity issues are no longer a constraint to saving with mobile money in rural areas.

The only result that is not consistent across all three countries is phone ownership: in Kenya, mobile money has a greater impact on likelihood of saving for those who lack a mobile phone. This is likely due to (1) using mobile money over the counter with an agent, and (2) accessing mobile money via the phone of another member of the household. Both of these mechanisms are more probable in Kenya, where mobile phone penetration and mobile money agent penetration are both higher, making it likely that a non-mobile phone owner can still easily access the service. The summary statistics in **Table 2** support the hypothesis that use of mobile money without a registered account is higher in Kenya, as 39 percent of Kenyan non-account holders have used mobile money before, compared to 20 percent in Uganda and 13 percent in Tanzania.

6.B. Coping with Negative Income Shocks

Since the regression results indicate that mobile money increases likelihood saving, especially to protect against emergencies, it is likely that these savings will better enable individuals to cope with negative income shocks. Using equation (4), I estimate the impact of mobile money account ownership on the ability to rely on savings to deal with a negative income shock. The results are presented in **Table 8**. In all three countries, the coefficient on the interaction term between shock and mobile money

account is positive and significant at the 1 percent level. In Uganda, mobile money increases likelihood of using savings to deal with a shock by 11.1 percent, in Kenya it increases by 7.3 percent, and in Tanzania it increases by 6.3 percent. These results indicate that mobile money does in fact provide a mechanism to smooth income when faced with emergencies such as bad weather, illness, and theft. The results also show that among those who do not encounter shocks, mobile money account holders are 8.3 percent, 3.7 percent, and 4.1 percent less likely to report using savings to deal with negative shocks than non-account holders in Uganda, Kenya, and Tanzania respectively. Non-account holders who encountered a negative income shock in the past 2 years are 15.7 percent, 14.8 percent, and 25.5 percent more likely to rely on savings to deal with shocks than non-account holders who did not experience a recent shock.

6.C. Education Outcomes

The results in **Table 4** indicate that mobile money increases likelihood of saving for education in both Uganda and Tanzania. This is a surprising result as the existing literature suggests that mobile money is more suitable for short-term purposes of saving, such as daily consumption. I examine the impact of mobile saving for education by estimating equation (5). The results are presented in **Table A.6**. In all three countries, the coefficient on mobile money account ownership is small and insignificant from zero. The impact on school enrollment is still insignificant when looking at enrollment by gender (results not shown). Therefore, while individuals use mobile money to save for education, this saving does not translate into improvements in education outcomes in the short term. The lack of significant results may be due to the fact that saving for education is a longer-term objective, and improvements in education outcomes may take

more time to accrue. In addition, as primary and secondary schooling is free in all three counties,[9] saving for education may be used to purchase school supplies or send students to private school, which may lead to improvements in education that are not captured by school enrollment rates.

6.D. Robustness Check: Two-Stage Least Squares

Although the OLS and probit models control for various factors that affect an individual's propensity to save, they may be subject to omitted variable bias, as individuals with a mobile money account may have higher propensity to save regardless of other factors. In addition, there is a possibility of reverse causality when people sign up for mobile money because they want to start saving, rather than saving as a result of having a mobile money account (see **Figure A.1** for the most common reasons for signing up for a mobile money account). Due to the concerns of endogeneity and reverse causality, I also explore an instrumental variable estimation strategy in order to confirm the causality of prior results.

The instrument must predict mobile money account ownership but not have a direct impact on an individual's likelihood to save. Possible instruments used in the aforementioned literature include perception of cost of other money transfer mechanisms before the introduction of M-PESA (Mbiti and Weil 2011), average mobile money use in the area (Demombynes and Thegeya 2012), and measures of availability of mobile money agents, including distance to an agent, a dummy variable of mobile money availability, and number of agents within a certain radius (Jack and Suri 2014; Lwanga and Adong 2016; Muyengera and Matsumoto 2016). The survey data used in this paper

[9] In Uganda, secondary schooling is only free for those who achieve a minimum score on exams taken at the conclusion of primary school.

includes information on distance to nearest mobile money agent, making it a possible instrument for the analysis. Using distance to agent as an instrument also leads to interesting policy implications, as it estimates the local average treatment effect of mobile money account ownership due to being near an agent.

As shown in **Figure 4**, distance to agent is a strong predictor of mobile money use. Those with a mobile money agent within 0.5 km of their house are much more likely to have a mobile money account than those with agents farther than 0.5 km away. This discontinuity provides the reasoning to use having an agent within a 0.5 km radius as the instrument for mobile money account ownership. This is a smaller radius than the 5 km radius used in the instrumental variable method of Jack and Suri (2014), but it is likely that agent density has increased since their 2010 survey. In Kenya, the number of mobile money agents more than tripled between 2011 and 2015, making a smaller radius a more appropriate instrument for the 2015 data (Jack and Suri 2016).

In order to estimate the impact of mobile money on overall savings, I estimate a two-stage least squares model with the following equations:

$$MM\_acct_i = \beta_0 + \beta_1 dist\_agent_i + \beta_2 X_i + v_i \quad (6)$$

$$saving_i = \beta_0 + \beta_1 \widehat{MM\_acct_i} + \beta_2 X_i + u_i \quad (7)$$

where $dist\_agent_i$ is a dummy for having an agent within a 0.5 km radius of one's house. The vector of controls, X_i, is the same as in the OLS specification. This method assumes that distance to agent is uncorrelated with the unobservable characteristics that affect an individual's propensity to save. The assumption of exogeneity is supported by a falsification test by Jack and Suri (2014) who use data from 1997-2007, before the

launch of M-PESA, to show that areas with higher agent density are not systematically different from those with lower agent density. It is not possible to conduct a similar falsification test with the data used in this paper because it lacks GPS location data and therefore cannot be compared to data from before the introduction of mobile money.

The 2SLS results for overall saving in the cross-country data set are shown in column 4 of **Table 5**. In the first stage, the F-statistic is large (558.37) and the distance to agent dummy is statistically significant at the 1 percent level, making it a strong instrument for mobile money use. The results are consistent with the OLS specification, showing that mobile money has a positive impact on saving that is statistically significant at the 5 percent level. According to the 2SLS specification, mobile money account ownership increases likelihood of saving by 34.5 percent.

Additional 2SLS results, presented in the appendix, continue to show a consistency with the trends shown in the OLS specification. Mobile money still appears to be a complement to formal savings mechanisms (bank accounts) and a substitute for informal savings mechanisms (friends, ROSCAs, and buying assets).[10] The 2SLS specification produces the same heterogeneous effects on saving, with mobile money having a greater impact for those who have lower financial access (rural areas, unbanked, below the poverty line) but are literate and therefore able to use mobile money. Finally, the 2SLS model also finds that mobile money enables users to cope with negative income shocks: mobile money users are 20.6 percent more likely to be

[10] In the 2SLS results, mobile money no longer leads to a significant decrease in saving under the mattress, although the point estimate is negative.

able to rely on savings than non-users in the event of a negative income shock.[11] The consistency between the OLS and 2SLS results provides robustness to the initial findings and indicates that the results are not biased due to problems of endogeneity or reverse causality.

7. Conclusion

This paper examines the impact of mobile money on savings. Due to the importance of consumption smoothing in Sub-Saharan Africa and the structure of mobile money accounts, I theorize that mobile money increases saving and decreases vulnerability to income shocks. This hypothesis is supported by existing literature, including Morawcsynski (2009), Demombynes and Thegeya (2012) and Ky, Rugemintwari, and Sauviat (2016). I also hypothesize that mobile money is a complement to formal bank accounts and a substitute to other informal savings mechanisms, as suggested in the existing literature (Mbiti and Weil 2011; Jack and Suri 2011; Morawczynski and Pickens 2009).

The regression analysis using 2015 individual survey data from Uganda, Kenya, and Tanzania finds that mobile money does increase likelihood of saving in general, as well as saving for emergencies, daily life, business, and education. These purposes of saving are particularly important to enable consumption smoothing and to decrease vulnerability. The finding that mobile money increases saving for business and education investments constitutes a departure from earlier literature which suggests that mobile money may be better suited to short-term savings (Morawczynski and Pickens

[11] The 2SLS specification for coping with shocks relies on two instruments (availability of an agent within a 0.5 km radius and its interaction with the shock dummy) to account for the two endogenous variables (mobile money account ownership and its interaction with the shock dummy).

2009). The impact of mobile money on savings is greater for those who are literate, below the poverty line, unbanked, in rural areas and working in agriculture. The results also indicate that mobile money increases financial inclusion as it increases saving with a formal bank account and decreases use of informal savings mechanisms. By enabling users to save for emergencies and become more financially included, mobile money increases the likelihood that a user can rely on savings when he or she experiences a negative income shock. Due to concerns about endogeneity, I estimate an instrumental variable model using distance to agent as an instrument for mobile money account ownership. The 2SLS specification finds a similar positive and significant relationship between mobile money and saving.

These results are consistent with a policy agenda that promotes financial inclusion by increasing access to mobile technologies. Policymakers in some countries are wary of mobile companies stepping into the banking sphere and require them to partner with banks when offering mobile money services. However, such heavy regulation of the mobile money industry tends to prevent it from reaching a wide segment of the population (Evans and Pirchio 2015). Mobile money accounts are a useful savings mechanism that can help to decrease vulnerability, and policymakers should consider these benefits when regulating the mobile money industry. At the same time, policymakers can play a role in incentivizing mobile companies to partner with banks in order to offer a wider range of savings products. In the future, mobile money has a potential to further incentivize savings through the introduction of interest-bearing mobile money products such as M-Kesho and M-Shwari in Kenya and MoKash in

Uganda. Additional research is needed to examine the adoption and impact of interest-bearing mobile savings.

References

Camner, Gunnar, Caroline Pulver, and Emil Sjöblom. 2012. "What Makes a Successful Mobile Money Implementation? Learnings from M-PESA in Kenya and Tanzania." GSMA Intelligence. http://www.gsma.com/mobilefordevelopment/wp-content/uploads/2012/03/What-makes-a-successful-mobile-money-implementation.pdf.

Cook, Tamara, and Claudia McKay. 2015. "How M-Shwari Works: The Story So Far." Access to Finance Forum 10. Washington, DC: Consultative Group to Assist the Poor and FSD Kenya. https://www.cgap.org/sites/default/files/Forum-How-M-Shwari-Works-Apr-2015.pdf.

Demirguc-Kunt, Asli, Leora Klapper, Dorothe Singer, and Peter Van Oudheusden. 2015. "The Global Findex Database 2014: Measuring Financial Inclusion around the World." Policy Research Working Paper 7255. Washington, DC: World Bank. http://documents.worldbank.org/curated/en/187761468179367706/pdf/WPS7255.pdf.

Demombynes, Gabriel, and Aaron Thegeya. 2012. "Kenya's Mobile Revolution and the Promise of Mobile Savings." Policy Research Working Paper 5988. Washington, DC: World Bank. doi:10.1596/1813-9450-5988.

Dupas, Pascaline, and Jonathan Robinson. 2013. "Savings Constraints and Microenterprise Development: Evidence from a Field Experiment in Kenya." *American Economic Journal: Applied Economics* 5 (1): 163–92. doi:10.1257/app.5.1.163.

Evans, David S., and Alexis Pirchio. 2015. "An Empirical Examination of Why Mobile Money Schemes Ignite in Some Developing Countries but Flounder in Most." Working Paper 723. Coase-Sandor Institute for Law and Economics, University of Chicago Law School.

Gugerty, Mary Kay. 2007. "You Can't Save Alone: Commitment in Rotating Savings and Credit Associations in Kenya." *Economic Development and Cultural Change* 55 (2): 251–82. doi:10.1086/508716.

Hulme, David, Karen Moore, and Armando Barrientos. 2009. "Assessing the Insurance Role of Microsavings." Working Paper 83. New York: UN Department of Economics and Social Affairs. http://www.un.org/esa/desa/papers/2009/wp83_2009.pdf.

Jack, William, and Tavneet Suri. 2011. "Mobile Money: The Economics of M-PESA." Working Paper 16721. Cambridge, MA: National Bureau of Economic Research. http://www.nber.org/papers/w16721.

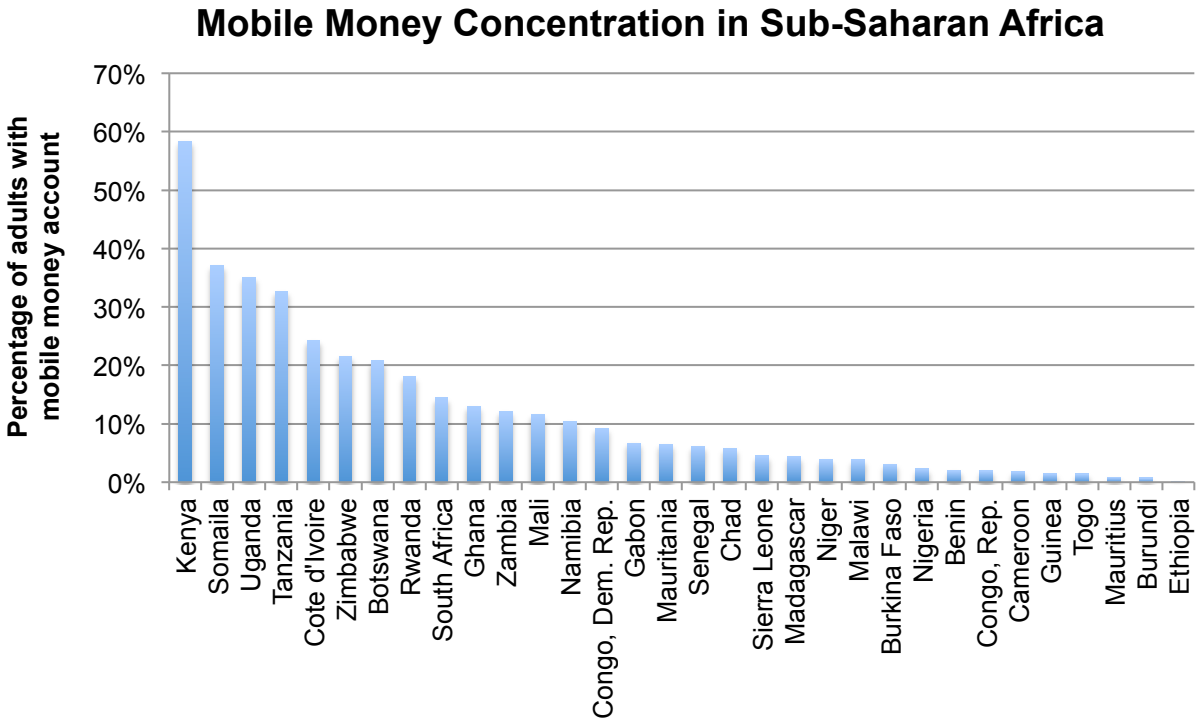
———. 2014. "Risk Sharing and Transaction Costs: Evidence from Kenya's Mobile Money Revolution." *American Economic Review* 104 (1): 183–223. doi:10.1257/aer.104.1.183.

———. 2016. "The Long-Run Poverty and Gender Impacts of Mobile Money." *Science* 354 (6317): 1288–92. doi:10.1126/science.aah5309.

"Kenya Wave 3 Report: FII Tracker Survey." 2016. Financial Inclusion Insights. Washington, DC: InterMedia.

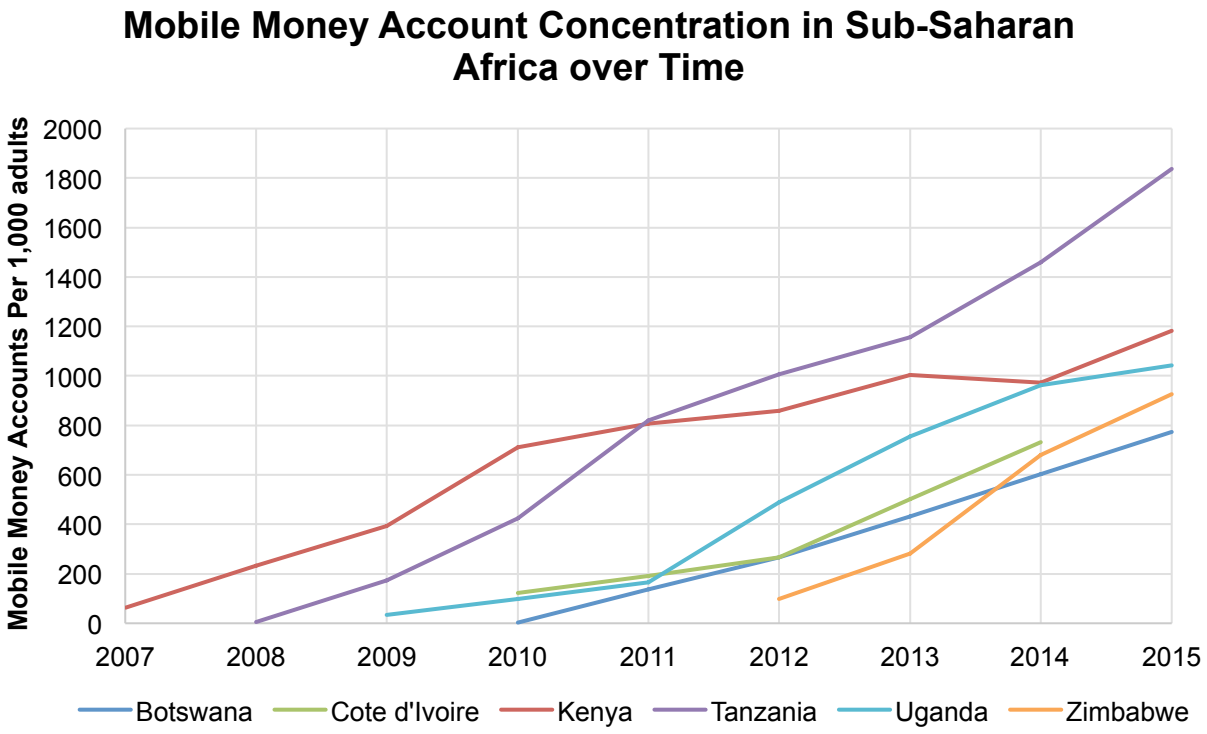
http://finclusion.org/uploads/file/reports/InterMedia%20FII%20Kenya%20Findings%20Wave%203%2022%20April%202016.pdf.
Ky, Serge, Clovis Rugemintwari, and Alain Sauviat. 2016. "Does Mobile Money Affect Savings Behavior? Evidence from a Developing Country." *Unpublished Working Paper*, July. doi:10.2139/ssrn.2815090.
Lwanga, Musa Mayanja, and Annet Adong. 2016. "A Pathway to Financial Inclusion: Mobile Money and Individual Savings in Uganda." Research Series Paper 127. Kampala, Uganda: Economic Research Policy Center. http://purl.umn.edu/242365.
Mbiti, Isaac, and David N. Weil. 2011. "Mobile Banking: The Impact of M-PESA in Kenya." Working Paper 17129. Cambridge, MA: National Bureau of Economic Research. http://www.nber.org/papers/w17129.pdf.
Morawczynski, Olga. 2009. "Saving Through the Mobile Phone—The Case of M-PESA." *Microfinance Information eXchange Microbanking Bulletin* 19 (December): 7–14.
Morawczynski, Olga, and Mark Pickens. 2009. "Poor People Using Mobile Financial Services: Observations on Customer Usage and Impact from M-PESA." Washington, DC: Consultative Group to Assist the Poor. http://www.cgap.org/publications/poor-people-using-mobile-financial-services.
Muyengera, Ggombe Kasim, and Tomoya Matsumoto. 2016. "Mobile Money, Remittances, and Household Welfare: Panel Evidence from Rural Uganda." *World Development* 79: 127–37. doi:10.1016/j.worlddev.2015.11.006.
Ndiwalana, Ali, Olga Morawczynski, and Oliver Popov. 2013. "Mobile Money Use in Uganda: A Preliminary Study." Proceedings of The 2nd International Conference on M4D 2010 Mobile Communication Technology for Development. Karlstad, Sweden: Karlstad University.
"Tanzania Wave 3 Report: FII Tracker Survey." 2016. Financial Inclusion Insights. Washington, DC: InterMedia. http://finclusion.org/uploads/file/reports/2015%20InterMedia%20FII%20TANZANIA%20Wave%20Report.pdf.
"The Mobile Economy: Sub-Saharan Africa." 2015. GSMA Intelligence. http://www.gsma.com/mobileeconomy/archive/GSMA_ME_SubSaharanAfrica_2015.pdf.
"Uganda Wave 3 Report: FII Tracker Survey." 2016. Financial Inclusion Insights. Washington, DC: InterMedia. http://finclusion.org/uploads/file/reports/InterMedia%20FII%20Wave%203%20Findings%20Uganda.pdf.
Vaughan, Pauline. 2007. "Early Lessons from the Deployment of M-PESA, Vodafone's Own Mobile Transactions Service." Policy Paper 6. The Transformational Potential of M-Transactions. Vodafone Group Plc. https://www.vodafone.com/content/dam/vodafone/about/public_policy/policy_papers/public_policy_series_6.pdf.

Figure 1



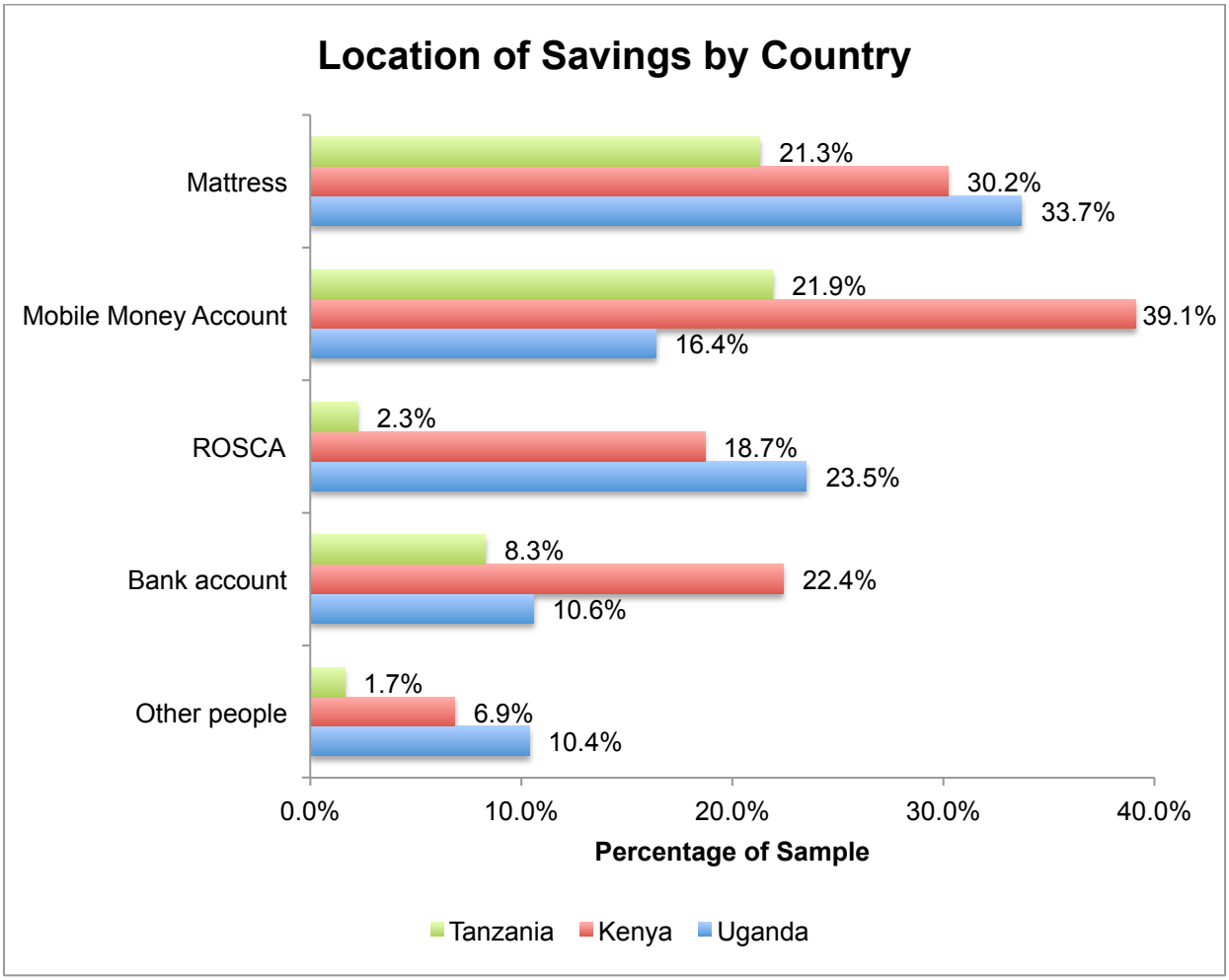
Source: World Bank Global Findex Database 2014
Note: No data on mobile money reported from Angola or Sudan

Figure 2



Source: IMF Financial Access Survey
Note: No data on mobile money reported from Somalia

Figure 3



Source: InterMedia Uganda Financial Inclusion Insights (FII) Survey (N=3,000, 15+), 2015, Tanzania FII Survey (N=3,001, 15+), 2015, and Kenya FII Survey (N=2,994, 15+), 2015
Note: Data is weighted to reflect national census demographics.

Figure 4

Likelihood of Mobile Money Account Ownership by Distance to Agent

Source: InterMedia Uganda Financial Inclusion Insights (FII) Survey (N=3,000, 15+), 2015, Tanzania FII Survey (N=3,001, 15+), 2015, and Kenya FII Survey (N=2,994, 15+), 2015
Notes: Results are for pooled cross-country data set and weighted to reflect national census demographics. "DK" refers to those who responded "don't know" when asked how far the nearest mobile money agent is from their house.

Table 1

Summary Statistics: Demographics and Financial Inclusion, by Country

	Uganda	Kenya	Tanzania
Panel A: Demographics			
Rural	0.748	0.729	0.623
Female	0.542	0.557	0.471
Married	0.534	0.400	0.605
Completed primary education	0.537	0.569	0.897
Completed secondary education	0.176	0.118	0.254
Completed college	0.0385	0.0256	0.0274
Below poverty line	0.267	0.302	0.215
Literate	0.567	0.774	0.897
Employed in Salaried Work	0.136	0.165	0.285
Employed in Irregular Work	0.566	0.440	0.509
Agricultural Occupation	0.414	0.241	0.536
Business Occupation	0.0772	0.113	0.0876
Panel B: Financial Inclusion			
Own mobile phone	0.545	0.758	0.767
Has access to a mobile phone	0.816	0.929	0.934
Has used mobile money	0.473	0.789	0.626
Has mobile money account	0.352	0.668	0.612
Active mobile money user	0.310	0.606	0.533
Has bank account	0.116	0.279	0.0941
Has non-bank account	0.0705	0.127	0.0325
Observations	3000	2994	3001

Source: InterMedia Uganda Financial Inclusion Insights (FII) Survey (N=3,000, 15+), 2015, Tanzania FII Survey (N=3,001, 15+), 2015, and Kenya FII Survey (N=2,994, 15+), 2015
Note: Data is weighted to reflect national census demographics. An active mobile money user is defined as using one's account within the last 90 days.

Table 2

Summary Statistics: Characteristics of Mobile Money Users and Non-Users by Country

	Uganda			Kenya			Tanzania		
	Non-account holders of mobile money	Mobile money account holders	P-value for difference of means	Non-account holders of mobile money	Mobile money account holders	P-value for difference of means	Non-account holders of mobile money	Mobile money account holders	P-value for difference of means
Panel A: Demographics									
Rural	0.831	0.596	(0.000)	0.729	0.595	(0.000)	0.845	0.623	(0.000)
Female	0.598	0.441	(0.000)	0.557	0.487	(0.000)	0.562	0.471	(0.000)
Married	0.537	0.528	(0.704)	0.400	0.637	(0.000)	0.652	0.605	(0.022)
Completed primary education	0.419	0.752	(0.000)	0.569	0.749	(0.000)	0.738	0.897	(0.000)
Completed secondary education	0.0878	0.338	(0.000)	0.118	0.392	(0.000)	0.0837	0.254	(0.000)
Completed college	0.00809	0.0945	(0.000)	0.0256	0.0819	(0.002)	0.00455	0.0274	(0.000)
Below poverty line	0.158	0.469	(0.000)	0.302	0.600	(0.000)	0.0888	0.215	(0.000)
Literate	0.453	0.776	(0.000)	0.774	0.853	(0.000)	0.752	0.897	(0.000)
Employed in Salaried Work	0.0762	0.246	(0.000)	0.0444	0.225	(0.000)	0.243	0.311	(0.000)
Employed in Irregular Work	0.602	0.501	(0.000)	0.318	0.501	(0.000)	0.560	0.477	(0.000)
Agricultural Occupation	0.477	0.298	(0.000)	0.181	0.270	(0.000)	0.673	0.450	(0.000)
Business Occupation	0.0587	0.111	(0.000)	0.0597	0.139	(0.000)	0.0436	0.115	(0.000)
Panel B: Financial Inclusion									
Own mobile phone	0.339	0.925	(0.000)	0.379	0.947	(0.000)	0.477	0.950	(0.000)
Has access to a mobile phone	0.724	0.984	(0.000)	0.795	0.995	(0.000)	0.850	0.988	(0.000)
Has used mobile money	0.195	0.985	(0.000)	0.391	0.987	(0.000)	0.130	0.939	(0.000)
Has mobile money account		1			1			1	
Active mobile money user		0.880			0.906			0.870	
Has bank account	0.0328	0.269	(0.000)	0.0518	0.391	(0.000)	0.0291	0.135	(0.000)
Has non-bank account	0.0371	0.132	(0.000)	0.0268	0.176	(0.000)	0.0192	0.0410	(0.002)
Observations	1964	1036		878	2116		1164	1837	

Source: InterMedia Uganda Financial Inclusion Insights (FII) Survey (N=3,000, 15+), 2015, Tanzania FII Survey (N=3,001, 15+), 2015, and Kenya FII Survey (N=2,994, 15+), 2015

Note: Data is weighted to reflect national census demographics. An active mobile money user is defined as using one's account within the last 90 days.

Table 3

Summary Statistics: Purpose of Savings for Mobile Money Users and Non-Users

	Full Sample	Non-account holders of mobile money	Mobile money account holders	P-value for difference of means
Protect against poverty and crime	0.502	0.410	0.561	(0.000)
Protect belongings	0.390	0.312	0.440	(0.000)
Daily consumption	0.525	0.418	0.594	(0.000)
Business	0.361	0.248	0.433	(0.000)
Education	0.152	0.0902	0.191	(0.000)
Expensive purchases	0.109	0.0877	0.123	(0.000)
Retirement	0.0827	0.0481	0.105	(0.000)
Observations	5988	2305	3683	

Source: InterMedia Uganda Financial Inclusion Insights (FII) Survey (N=3,000, 15+), 2015, Tanzania FII Survey (N=3,001, 15+), 2015, and Kenya FII Survey (N=2,994, 15+), 2015
Note: Results are for pooled cross-country data set. Data is weighted to reflect national census demographics.

Table 4

Impact of Mobile Money Account Ownership on Savings by Purpose of Saving

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Overall saving	**Saving for business**	**Saving for education**	**Saving for retirement**	**Saving to buy things**	**Saving to protect against poverty and crime**	**Saving to protect belongings**	**Saving for daily life**
Panel A: Uganda								
Mobile Money Account	0.105***	0.0900***	0.0543**	0.0151	0.0396*	0.0624*	0.0623*	0.0846**
	(0.0260)	(0.0312)	(0.0235)	(0.0175)	(0.0236)	(0.0332)	(0.0318)	(0.0330)
Observations	3000	2253	2253	2253	2253	2253	2253	2253
Panel B: Kenya								
Mobile Money Account	0.0864***	0.0574*	0.0342	-0.0134	-0.0558**	0.0968***	0.0613**	0.125***
	(0.0271)	(0.0314)	(0.0229)	(0.0154)	(0.0243)	(0.0304)	(0.0305)	(0.0327)
Observations	2994	2287	2287	2287	2287	2287	2287	2287
Panel C: Tanzania								
Mobile Money Account	0.111***	0.0128	0.0854***	0.0179	-0.00783	-0.0426	-0.0257	-0.0393
	(0.0246)	(0.0311)	(0.0277)	(0.0122)	(0.0189)	(0.0367)	(0.0376)	(0.0328)
Observations	3001	1448	1448	1448	1448	1448	1448	1448

Source: InterMedia Uganda Financial Inclusion Insights (FII) Survey (N=3,000, 15+), 2015, Tanzania FII Survey (N=3,001, 15+), 2015, and Kenya FII Survey (N=2,994, 15+), 2015

Notes: Standard errors are in parentheses. Additional controls (not displayed) include age, age squared, female, rural, married, number of children, primary education, progress out of poverty index score, phone ownership, employment status, and occupation category. Statistically significant coefficients at the 10%, 5%, and 1% levels are marked with *, **, and *** respectively.

Table 5

Impact of Mobile Money Account Ownership on Overall Likelihood of Saving

	(1) OLS	(2) OLS	(3) Probit	(4) 2SLS
Mobile Money Account	0.109***	0.119***	0.107***	0.345**
	(0.0148)	(0.0229)	(0.0140)	(0.164)
Uganda * Mobile Money Account		-0.0402		
		(0.0279)		
Tanzania * Mobile Money Account		0.00709		
		(0.0286)		
Observations	8995	8995	8995	8995
F-statistic of first stage				558.37

Source: Intermedia Uganda Financial Inclusion Insights (FII) Survey (N=3,000, 15+), 2015, Tanzania FII Survey (N=3,001, 15+), 2015, and Kenya FII Survey (N=2,994, 15+), 2015
Notes: Results are for pooled cross-country data set. Standard errors are in parentheses. Probit results shown are marginal effects. Additional controls (not displayed) include age, age squared, female, rural, married, number of children, primary education, progress out of poverty index score, phone ownership, employment status, occupation category, and country. In 2SLS analysis the instrument is a dummy for having a mobile money agent within a 0.5 km radius. Statistically significant coefficients at the 10%, 5%, and 1% levels are marked with *, **, and *** respectively.

Table 6

Impact of Mobile Money Account Ownership on Savings by Location of Saving

	(1) Bank Saving	(2) Mattress Saving	(3) Saving with Friends	(4) ROSCA Saving	(5) Saving by buying assets
Panel A: Uganda					
Mobile Money Account	0.0994***	-0.113***	0.0184	-0.0102	-0.0274
	(0.0182)	(0.0273)	(0.0182)	(0.0255)	(0.0201)
Observations	3000	3000	3000	3000	3000
Panel B: Kenya					
Mobile Money Account	0.0718***	-0.0895***	-0.0506***	0.0325*	-0.00629
	(0.0186)	(0.0273)	(0.0170)	(0.0186)	(0.0150)
Observations	2994	2994	2994	2994	2994
Panel C: Tanzania					
Mobile Money Account	0.0516***	-0.0448**	-0.00740	0.00534	-0.0131
	(0.0112)	(0.0207)	(0.00620)	(0.00541)	(0.00885)
Observations	3001	3001	3001	3001	3001

Source: InterMedia Uganda Financial Inclusion Insights (FII) Survey (N=3,000, 15+), 2015, Tanzania FII Survey (N=3,001, 15+), 2015, and Kenya FII Survey (N=2,994, 15+), 2015

Notes: Standard errors are in parentheses. Additional controls (not displayed) include age, age squared, female, rural, married, number of children, primary education, progress out of poverty index score, phone ownership, employment status, and occupation category. Statistically significant coefficients at the 10%, 5%, and 1% levels are marked with *, **, and *** respectively.

Table 7

Heterogeneous Impacts of Mobile Money Account Ownership on Overall Saving

Uganda		Kenya		Tanzania	
Rural	**Urban**	**Rural**	**Urban**	**Rural**	**Urban**
0.246***	0.0512*	0.121***	0.0670*	0.152***	0.101***
(0.0564)	(0.0290)	(0.0408)	(0.0355)	(0.0575)	(0.0269)
N= 800	N= 2200	N= 1154	N= 1840	N= 854	N= 2147
Unbanked	**Banked**	**Unbanked**	**Banked**	**Unbanked**	**Banked**
0.0962***	0.00137	0.0752**	-0.112***	0.112***	-0.0238
(0.0284)	(0.0364)	(0.0300)	(0.0278)	(0.0252)	(0.0829)
N= 2681	N= 319	N= 2134	N= 860	N= 2728	N= 273
Below poverty line	**Above poverty line**	**Below poverty line**	**Above poverty line**	**Below poverty line**	**Above poverty line**
0.146***	0.0887***	0.121***	0.0575	0.202***	0.0942***
(0.0361)	(0.0333)	(0.0397)	(0.0370)	(0.0661)	(0.0265)
N= 964	N= 2036	N= 1520	N= 1474	N= 517	N= 2484
Farm Occupation	**Business/Professional**	**Farm Occupation**	**Business/Professional**	**Farm Occupation**	**Business/Professional**
0.115***	0.0851**	0.0927***	0.0640	0.167***	0.0728**
(0.0322)	(0.0433)	(0.0311)	(0.0542)	(0.0401)	(0.0307)
N= 1769	N= 1231	N= 2231	N= 763	N= 1368	N= 1633
Illiterate	**Literate**	**Illiterate**	**Literate**	**Illiterate**	**Literate**
0.0642	0.102***	0.0441	0.0966***	0.0828	0.116***
(0.0420)	(0.0321)	(0.0596)	(0.0306)	(0.0592)	(0.0271)
N= 1425	N= 1575	N= 579	N= 2415	N= 486	N= 2515
No phone	**Own phone**	**No phone**	**Own phone**	**No phone**	**Own phone**
0.0635	0.105***	0.163***	0.0695**	0.109*	0.106***
(0.0710)	(0.0282)	(0.0539)	(0.0317)	(0.0608)	(0.0269)
N= 1409	N= 1591	N= 656	N= 2338	N= 688	N= 2313

Source: InterMedia Uganda Financial Inclusion Insights (FII) Survey (N=3,000, 15+), 2015, Tanzania FII Survey (N=3,001, 15+), 2015, and Kenya FII Survey (N=2,994, 15+), 2015

Notes: Coefficients are for OLS regression of overall saving on mobile money account ownership. Standard errors are in parentheses. Additional controls (not displayed) include age, age squared, female, rural, married, number of children, primary education, progress out of poverty index score, phone ownership, employment status, and occupation category. Statistically significant coefficients at the 10%, 5%, and 1% levels are marked with *, **, and *** respectively.

Table 8

Impact of Mobile Money Account Ownership on Using Savings in Event of a Negative Shock

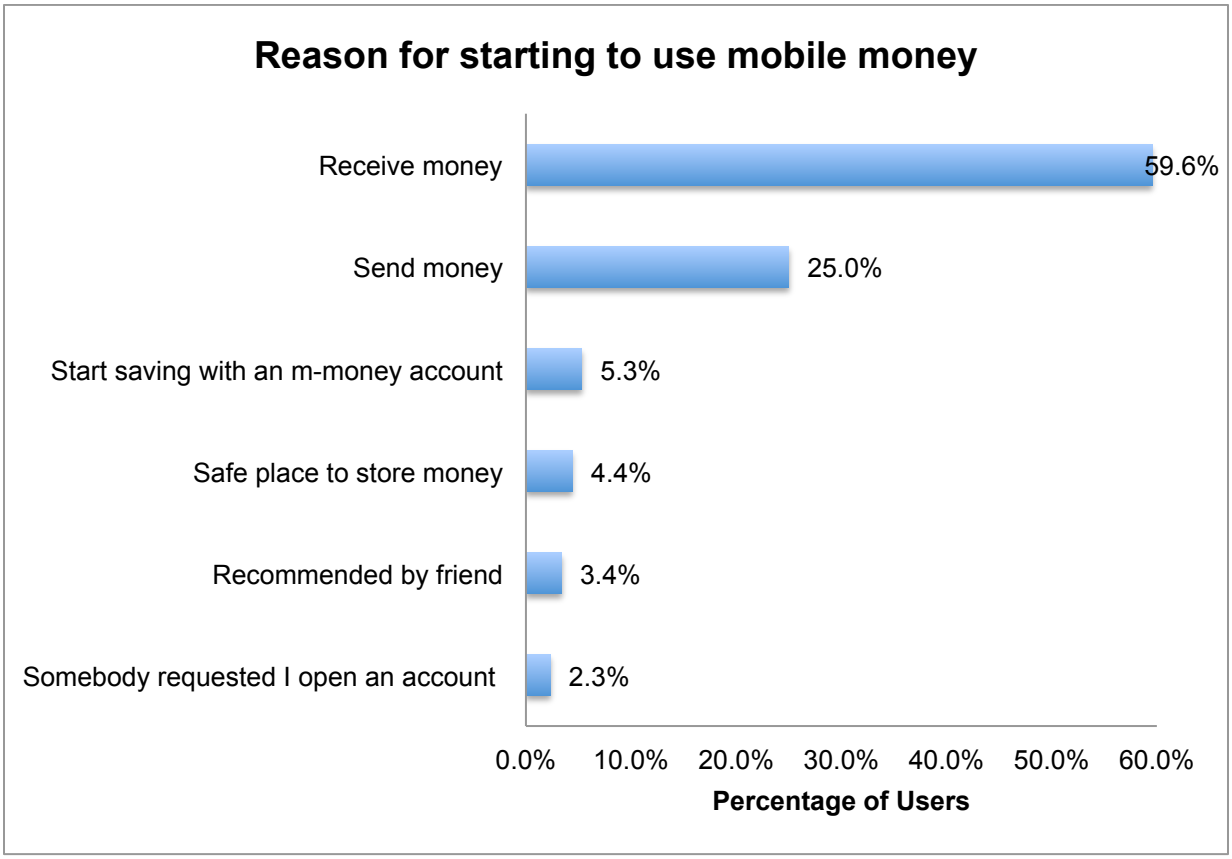
	(1) Uganda	(2) Kenya	(3) Tanzania
Mobile Money Account	-0.0833***	-0.0369***	-0.0412***
	(0.0174)	(0.0127)	(0.0144)
Shock	0.157***	0.148***	0.255***
	(0.0125)	(0.0165)	(0.0172)
Shock * Mobile Money Account	0.111***	0.0729***	0.0628***
	(0.0221)	(0.0189)	(0.0228)
Observations	3000	2994	3001

Source: InterMedia Uganda Financial Inclusion Insights (FII) Survey (N=3,000, 15+), 2015, Tanzania FII Survey (N=3,001, 15+), 2015, and Kenya FII Survey (N=2,994, 15+), 2015

Notes: Standard errors are in parentheses. Shock is a dummy variable for experiencing a negative income shock in the last 2 years. Additional controls (not displayed) include age, age squared, female, rural, married, number of children, primary education, progress out of poverty index score, phone ownership, employment status, and occupation category. Statistically significant coefficients at the 10%, 5%, and 1% levels are marked with *, **, and *** respectively.

Appendix Figures and Tables

Figure A.1



Source: InterMedia Uganda Financial Inclusion Insights (FII) Survey (N=3,000, 15+), 2015, Tanzania FII Survey (N=3,001, 15+), 2015, and Kenya FII Survey (N=2,994, 15+), 2015
Note: Data is weighted to reflect national census demographics.

Table A.1

Frequency of Types of Negative Income Shocks

Shock	Uganda	Kenya	Tanzania
Flood, fire, or other natural disaster	0.221	0.0936	0.0997
Theft	0.427	0.166	0.164
Bad weather or pests destroy livestock/crops	0.653	0.366	0.347
Job loss or reduced wage	0.222	0.252	0.153
Death of main income-earner	0.0727	0.0408	0.0445
Increased cost of agricultural/business inputs	0.388	0.258	0.220
Decreased price of goods you sell	0.445	0.249	0.285
Loss of savings	0.257	0.145	0.136
Major medical emergency	0.410	0.159	0.286
Divorce or separation	0.0701	0.0257	0.0658
Observations	3000	2994	3001

Source: InterMedia Uganda Financial Inclusion Insights (FII) Survey (N=3,000, 15+), 2015, Tanzania FII Survey (N=3,001, 15+), 2015, and Kenya FII Survey (N=2,994, 15+), 2015

Table A.2

Robustness Check: Impact of Mobile Money Account Ownership on Saving by Purpose of Saving

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	Saving for business	**Saving for education**	**Saving for retirement**	**Saving to buy things**	**Saving to protect against poverty and crime**	**Saving to protect belongings**	**Saving for daily life**
Panel A: OLS							
Mobile Money Account	0.0724***	0.0562***	0.0116	0.00137	0.0690***	0.0535***	0.0848***
	(0.0180)	(0.0140)	(0.00931)	(0.0134)	(0.0190)	(0.0187)	(0.0191)
Observations	5988	5988	5988	5988	5988	5988	5988
Panel B: Probit							
Mobile Money Account	0.0726***	0.0533***	0.0120	0.00116	0.0683***	0.0540***	0.0822***
	(0.0177)	(0.0142)	(0.0105)	(0.0130)	(0.0189)	(0.0187)	(0.0187)
Observations	5988	5988	5988	5988	5988	5988	5988

Source: Intermedia Uganda Financial Inclusion Insights (FII) Survey (N=3,000, 15+), 2015, Tanzania FII Survey (N=3,001, 15+), 2015, and Kenya FII Survey (N=2,994, 15+), 2015

Notes: Results are for pooled cross-country data set. Standard errors are in parentheses. Probit results shown are marginal effects. Additional controls (not displayed) include age, age squared, female, rural, married, number of children, primary education, progress out of poverty index score, phone ownership, employment status, occupation category, and country. Statistically significant coefficients at the 10%, 5%, and 1% levels are marked with *, **, and *** respectively.

Table A.3

Robustness Check: Impact of Mobile Money Account Ownership on Saving by Location of Savings

	(1) Bank Saving	(2) Mattress Saving	(3) Saving with Friends	(4) ROSCA Saving	(5) Saving by buying assets
Panel A: OLS					
Mobile Money Account	0.0797***	-0.0833***	-0.00704	0.0193*	-0.00906
	(0.00904)	(0.0142)	(0.00816)	(0.0102)	(0.00842)
Observations	8995	8995	8995	8995	8995
Panel B: Probit					
Mobile Money Account	0.0840***	-0.0828***	-0.00817	0.0200*	-0.00989
	(0.0105)	(0.0139)	(0.00809)	(0.0107)	(0.00818)
Observations	8995	8995	8995	8995	8995
Panel C: 2SLS					
Mobile Money Account	0.209**	-0.0414	-0.212***	-0.320***	-0.158**
	(0.0893)	(0.123)	(0.0665)	(0.0981)	(0.0662)
Observations	8995	8995	8995	8995	8995
F-statistic of first stage	590.07	590.07	590.07	590.07	590.07

Source: InterMedia Uganda Financial Inclusion Insights (FII) Survey (N=3,000, 15+), 2015, Tanzania FII Survey (N=3,001, 15+), 2015, and Kenya FII Survey (N=2,994, 15+), 2015

Notes: Results are for pooled cross-country data set. Standard errors are in parentheses. Probit results shown are marginal effects. Additional controls (not displayed) include age, age squared, female, rural, married, number of children, primary education, progress out of poverty index score, phone ownership, employment status, occupation category, and country. In 2SLS analysis the instrument is a dummy for having a mobile money agent within a 0.5 km radius. Statistically significant coefficients at the 10%, 5%, and 1% levels are marked with *, **, and *** respectively.

Table A.4

Robustness Check: Heterogeneous Impacts of Mobile Money Account Ownership on Overall Saving

OLS		2SLS	
Rural	**Urban**	**Rural**	**Urban**
0.173***	0.0883***	1.134**	0.177
(0.0291)	(0.0172)	(0.574)	(0.169)
N= 2808	N= 6187	N= 2808	N= 6187
Unbanked	**Banked**	**Unbanked**	**Banked**
0.104***	-0.0567**	0.389**	-0.286
(0.0158)	(0.0282)	(0.189)	(0.343)
N= 7543	N= 1452	N= 7543	N= 1452
Illiterate	**Literate**	**Illiterate**	**Literate**
0.0790***	0.117***	0.148	0.399**
(0.0300)	(0.0170)	(0.310)	(0.189)
N= 2490	N= 6505	N= 2490	N= 6505
Below poverty line	**Above poverty line**	**Below poverty line**	**Above poverty line**
0.152***	0.0945***	0.415*	0.287
(0.0257)	(0.0180)	(0.225)	(0.228)
N= 3001	N= 5994	N= 3001	N= 5994
Farm Occupation	**Business/Professional**	**Farm Occupation**	**Business/Professional**
0.129***	0.0804***	0.317	0.353
(0.0194)	(0.0232)	(0.202)	(0.280)
N= 5368	N= 3627	N= 5368	N= 3627

Source: InterMedia Uganda Financial Inclusion Insights (FII) Survey (N=3,000, 15+), 2015, Tanzania FII Survey (N=3,001, 15+), 2015, and Kenya FII Survey (N=2,994, 15+), 2015
Notes: Results are for pooled cross-country data set. Coefficients are for OLS and 2SLS regressions of overall saving on mobile money account ownership. Standard errors are in parentheses. Additional controls (not displayed) include age, age squared, female, rural, married, number of children, primary education, progress out of poverty index score, phone ownership, employment status, occupation category, and country. In 2SLS analysis the instrument is a dummy for having a mobile money agent within a 0.5 km radius. Statistically significant coefficients at the 10%, 5%, and 1% levels are marked with *, **, and *** respectively.

Table A.5

Robustness Check: Impact of Mobile Money Account Ownership on Using Savings in Event of a Negative Income Shock

	(1) OLS	(3) 2SLS
Mobile Money Account	-0.0541***	-0.0345
	(0.00814)	(0.0928)
Shock	0.189***	0.113***
	(0.00921)	(0.0394)
Shock * Mobile Money Account	0.0803***	0.206***
	(0.0119)	(0.0646)
Observations	8995	8995
F-statistic of first stage: Mobile Money Account		500.25
F-statistic of first stage: Shock * Mobile Money Account		438.74

Source: InterMedia Uganda Financial Inclusion Insights (FII) Survey (N=3,000, 15+), 2015, Tanzania FII Survey (N=3,001, 15+), 2015, and Kenya FII Survey (N=2,994, 15+), 2015

Notes: Results are for pooled cross-country data set. Standard errors are in parentheses. Shock is a dummy variable for experiencing a negative income shock in the last 2 years. Additional controls (not displayed) include age, age squared, female, rural, married, number of children, primary education, progress out of poverty index score, phone ownership, employment status, occupation category, and country. In 2SLS analysis the instruments are a dummy for having a mobile money agent within a 0.5 km radius and its interaction term with the shock dummy. Statistically significant coefficients at the 10%, 5%, and 1% levels are marked with *, **, and *** respectively.

Table A.6

Impact of Mobile Money Account Ownership on School Enrollment

	(1) Uganda	(2) Kenya	(3) Tanzania
Mobile Money Account	-0.000688	-0.0171	0.00620
	(0.0151)	(0.0235)	(0.0194)
Observations	2162	916	871

Source: InterMedia Uganda Financial Inclusion Insights (FII) Survey (N=3,000, 15+), 2015, Tanzania FII Survey (N=3,001, 15+), 2015, and Kenya FII Survey (N=2,994, 15+), 2015
Note: Standard errors are in parentheses. Outcome is percentage of children in the household of school-going age who are enrolled in school. Additional controls (not displayed) include age, age squared, female, rural, married, number of children, primary education, progress out of poverty index score, phone ownership, employment status, and occupation category. Statistically significant coefficients at the 10%, 5%, and 1% levels are marked with *, **, and *** respectively.